THE NEXT TRANSFORMATION IN THE DELIVERY OF HEALTH CARE

DESPITE the perils of predicting the future of our health care system, many people have weighed in on how they expect the delivery of care to evolve.[1-3] Such predictions are usually based on the conspicuous trend toward industrial-size delivery networks involving large populations enrolled in managed-care plans, vertically integrated medical center conglomerates, and a few giant insurance companies.[1-3] In my view, several subtle trends will have a profound influence on the delivery of health care: the rapid growth of computer-based electronic communication, the fact that a new generation is increasingly comfortable with the electronic transfer of information, and the shift toward giving patients more responsibility for their health care decisions. These trends are likely to induce cultural changes in the delivery of care even more revolutionary than any restructuring that is going on today. On-line, computer-assisted communication between patients and medical data bases and between patients and physicians promises to replace a substantial amount of the care now delivered in person.

Trends suggesting that medical care will be delivered on-line are easily detected. Many people either own or have ready access to personal computers and use them now in their studies or business activities. Many already have access to the Internet, the immense collection of independent but cooperating computer networks that connects 2 to 3 million host computers.[4,5] The growth of the Internet has been extraordinary. The number of networks increased gradually from 2000 in 1989 and 1990 to more than 20,000 in mid-1994, and currently a new network is connected every 10 to 20 minutes.[4,6] Estimates of the number of users on the Internet today are unreliable, though figures of 7 million to 30 million are often cited.[5,7] Until recently, it has been extremely difficult to search for information in the vast reaches of the Internet, but new software tools are making the computer files, bulletin boards, and newsletters more accessible and easier to find. These tools include free "client–server" programs such as Gopher and World Wide Web. Gopher permits users to move quickly from one part of the Internet to another through a menu system and to find and transfer files. The World Wide Web, a multimedia hypertext system, provides linkages to related subjects. Both programs are accessible through a variety of interfaces (such as MacWeb, Mosaic, Netscape, and TurboGopher) that permit the user to search for information by clicking on displayed topics with a mouse.[8,9] In addition, many new search tools from companies such as America Online, CompuServe, and Prodigy are menu-driven, simple to use with minimal training, and relatively inexpensive.

New multimedia technology, such as "smart boxes" and "smart television sets," which combine the functions of the computer, telephone, fax, compact disc, and video,[10] promises to simplify electronic communication even more. In addition, the extension of fiberoptic and coaxial-cable communication all over the country — even in remote regions — will make telecommunication of all kinds, including "telemedicine,"[11] accessible to nearly everyone. A critical factor in the medical use of the new technology is the trend toward patients' taking more responsibility for their own medical care. There is a growing emphasis on incorporating patients' preferences into medical decision making.[12] Already patients are using interactive video discs to help them make medical decisions and home monitoring devices to measure their blood pressure and blood glucose and to test themselves for pregnancy.[13-16]

An anecdote might help illustrate this future on-line delivery system. The author of a popular book on computer-based communication tells the story of finding a blood-filled tick on the skin of his two-year-old daughter at 11 o'clock at night. While his wife called the pediatrician, he logged into an electronic conferencing system based in San Francisco that involves people around the world. Within minutes he learned from a physician on-line how to remove the tick safely and had done so before the pediatrician called back.[17]

Although a health care delivery system that depends, even partly, on on-line computer communications holds considerable promise, the problems it poses are enormous. Familiar issues such as the quality of care, the continuity of care, the validity and consistency of the available information, privacy, and effects on the physician–patient relationship will all surface as major areas of concern.

The amount of medical information now available on-line that is appropriate for a layperson is relatively small, but commercial services already provide "textbook" information comprehensible to an intelligent layperson as well as access to group conversations (so-called forums) about subjects such as diabetes, eating disorders, and vitamins. Although some of the information conveyed in these forums is quite authoritative, much is highly questionable. Indeed, many of the participants use pseudonyms, and the extent of their expertise is often not revealed. Nonetheless, this phenomenon illustrates the potential of such a system. Some medical centers are already providing authoritative on-line medical information and advice,[18,19] some in conjunction with industry.[18]

Organizing and coordinating care for individual patients would require thoughtful planning. Ideally, responsibility for decisions could be shared by the patient and the physician, with the patient playing a substantial part. The patient could tap into authoritative medical data bases, including textbooks and newsletters formulated expressly for lay audiences. For some common problems, such as urinary and upper respiratory infections, patients could use available algorithms on-line to diagnose their own ailments and even treat themselves. Some clinical problems, even complex ones, could be handled by an on-line consultation with a physician. Changes in the dosage of insulin, anticoagulants, antihypertensive drugs, or diuretics, the management of many childhood diarrheas, and decisions about when to give tetanus boosters and when during labor a woman should go to the birthing center are but a few examples. Standard reminders could be sent on-line for many routine screening tests or vaccinations. The inter-

action with an on-line computer system can be quite comfortable. Studies show that many patients feel even less discomfort "talking" to a computer about personal matters than to a physician.[20-22] If it was done right, the on-line computer system would function as a "virtual physician" in a new kind of house call.

Pundits who have speculated about how the computer will influence the practice of medicine have generally assumed that a computer programmed with medical knowledge would supply the "intelligence" and that physicians or physician-surrogates would call on this "artificial intelligence" to deliver care.[23-25] Unfortunately, although much progress has been made, most of the computer-based diagnostic and therapeutic systems available today are not sufficiently reliable for these tasks.[26] In an on-line system of care, the computer would function principally as a communication device, and the cognition would be supplied by a physician. Real, not artificial, intelligence would be brought to bear on serious health problems.

Because anyone can use the Internet, the accuracy of information and advice on medical matters will depend, as it does now, on the expertise of the professional providing that advice. In addition to this problem of quality control, there are many practical limitations to an on-line delivery system. First, despite the recent expansion of on-line communication, we do not know whether the public will accept this kind of communication as a way of life, nor whether improvements in science education will improve the public's understanding of medical information.[27] Issues such as the ease of use will have to be addressed: undoubtedly many will lag behind in the use of any kind of on-line information, and some will never use it. We will have to learn what kinds of medical problems can be safely and effectively handled remotely. People are likely to be better informed about their own health than they are now, but they will probably be barraged with conflicting reports, varied opinions, and contradictory recommendations, including a good deal of misinformation. And a new conflict will emerge. Physicians have taught for years that when they treat themselves they have a fool for a patient, yet we now believe that patients should take more responsibility for their own care. In the new mode, some mechanism will be needed to foster appropriate patient-centered responsibility while providing protection against dangerous self-diagnosis and self-treatment.

Some people will object to receiving some of their care this way. They will still want to hear a human voice on the telephone even though it takes hours to make contact. No doubt, something important will be lost if physicians no longer see patients in person for everyday problems. The "laying on of hands" seems to have therapeutic value. Maintaining the privacy of sensitive personal information is still another serious matter. Nobody but the patient and his physician should know whether he has blood in his stool or sexual dysfunction.

Affordability will become an issue if the government stops supporting the Internet.[28] Industry will certainly much they will charge, and how much control the government should have are other questions that will require answers. Because the expense of new technology will further widen the gulf between those who have access to care and those who do not (or at least exaggerate the difference in the quality of care between the two groups), it will be critical to find a way to protect and treat those unable to use or pay for an on-line system.

A widely implemented on-line system would have a profound effect on those who deliver care. Hospitals, medical centers, and health maintenance organizations would probably become integrated into an electronic network, sell their expertise, and link their capitated populations on-line with their own providers. The traditional role of physicians would change greatly. For one thing, physicians would be expected to interpret much more information. How they will be able to interpret the symptoms and results of home laboratory tests and the large amount of unfiltered and possibly disorganized information that could inundate them in the form of patients' on-line messages is not clear. Credentialing, licensure, and malpractice will take on unique dimensions when medical advice and decisions are transmitted by a communications medium that crosses state and national boundaries. The nature of a patient's medical record will also change. Inevitably, an electronic data repository will be developed for each patient, but deciding what form it will take and which institution or entity should be responsible for maintaining it will require considerable attention. If much care is handled on-line, personal encounters will focus principally on the most serious problems. In that case, we might need fewer primary care physicians, nurse practitioners, and even specialists than is being predicted today.

Clearly these projections about the future health care system could be wrong; yet because widespread social transformations have often been triggered by technology, we must not ignore these remarkable trends. Although predicting is perilous, not predicting is even more perilous. It leaves us unprepared for the changes going on right under our noses, confronts us with recurrent surprises, and most problematic, makes us reactors to change instead of agents of change.

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VISION WITHOUT SIGHT

The lamp of the body is the eye. If your eyes are sound, you will have light for your whole body; if the eyes are bad, your whole body will be in darkness.

— Matthew 6:22–23
New English Bible

VISION is the dominant human sense. The processing of photic information begins in the retina, continues in subcortical visual centers, and reaches its greatest complexity in the cerebral cortex.[1] One characteristic of this processing is the segregation of information among visual pathways and centers. Features such as location, movement, form, and color are segregated, and thus visual perception may be selectively impaired by disorders affecting individual pathways. The ultimate visual disorder is blindness. The work of Czeisler and his colleagues with blind subjects, reported in this issue of the *Journal*,[2] involves an aspect of vision that ordinarily receives little attention. Most of the subjects were blind as a consequence of devastating retinal disease. They did not perceive any visual stimuli, including bright light, and the severity of their impairment was verified by appropriate physiologic investigation. Yet in 3 of the 10 subjects who had normal nocturnal increases in melatonin secretion, the increases were suppressed when the subjects were exposed to bright light. This response to light was blocked by covering the eyes in the light-sensitive subjects as it would be blocked in normal persons. How are we to understand this divergence between the lack of perception of light and the hormonal response to light?

The answer lies in our increasing understanding of the role of the visual system as it affects the temporal organization of behavior. Human behavior, like that of animals, is organized into cycles of rest and activity, sleep and waking. This orderly alternation is not a passive response to the solar cycle of light and darkness, but a complex interaction between endogenous rhythms and the solar cycle. Endogenous circadian rhythms persist in the absence of a light–dark cycle. For example, in people kept in isolation from the regular light–dark cycle, the rhythm of rest and activity is maintained for many days, although with a period that slightly exceeds 24 hours.[3] Under ordinary circumstances, however, the period is influenced by the solar cycle to be exactly 24 hours — a process termed entrainment. The periodicity of the endogenous circadian pacemaker, or clock, is normally entrained by the solar cycle.

The generation and entrainment of circadian rhythms in mammals are functions of a specific neural system, the circadian timing system. The endogenous generation of rhythms indicates that a neural pacemaker is an essential part of this system. There is abundant evidence that the suprachiasmatic nucleus of the hypothalamus is this pacemaker, responsible for generating the circadian rhythm of rest and activity and also the rhythms of a large number of physiologic and endocrine functions, including the secretion of melatonin.[4] The paired suprachiasmatic nuclei lie just above the optic chiasm in the anterior hypothalamus and have efferent axonal projections linking them to effector systems mediating circadian control. This pathway includes axonal projections from the suprachiasmatic nuclei to the paraventricular nuclei of the hypothalamus, direct projections from the paraventricular nuclei to the preganglionic sympathetic neurons of the upper thoracic intermediolateral cell columns, and projections from these neurons to the superior cervical ganglia innervating the pineal gland, the site of melatonin synthesis.[5]

Entrainment is a response to photic input through which the circadian clock is set. The pathway of entrainment has three components. The first is a set of retinal photoreceptors. Although they have not yet been definitively identified, the evidence for the existence of a distinct set of retinal photoreceptors governing circadian rhythms is substantial. In mice with a hereditary degeneration of photoreceptors that leads to blindness, the circadian responses to light are unaffected.[6] This indicates that circadian photoreception is mediated either by a subgroup of rods or cones unaffected by the mutation or by an unrecognized class of photoreceptors. Whatever their nature, the photoreceptors are likely to be linked by bipolar retinal cells (the second component of the pathway) to a set of ganglion cells (the third component) that projects through the optic nerves and the optic chiasm to the suprachias-

Presentation to

National Cable Television Association
The Joint Board
Jones Intercable

Medical College of Georgia
Georgia Institute of Technology

Ambulatory Care Center
Conference Room, BP-4306
7 February 1997

8:30A	Welcome	Max E. Stachura, M.D. (MCG) Charlie Railey (JI)
	Introduction - Telemedicine Around Georgia - GSAMS - Vision and Start-up	Max E. Stachura, M.D. (MCG)
8:45A	Why Georgia - Demographics	R. Kevin Grigsby, DSW (MCG)
	GSTP - Development - Utilization	Laura Adams (MCG)
9:10A	Clinical Correlates - Acute/Consultative vs Chronic/Managerial - The Electronic House Call	Max E. Stachura, M.D. (MCG)
9:30A	Coinciding Factors - 1997 - MCG/GIT/GRA - Corporate Partners - FCC Act of 1996 - HCFA - Citizen's Acceptance	R. Kevin Grigsby, DSW (MCG)
	Jones Intercable Perspective	Charlie Railey (JI)
9:45A	The Technical Spectrum - Components of the Whole/A Plan for Georgia - GSTP - The Electronic House Call	 Jim Toler, MSEE (GIT) John Searle, Ph.D. (MCG) Mike Burrow, MSEE (GIT)
10:15A	Break	
10:30A	Demonstration (4th Floor H&C) - GSTP - EHC	
11:30A	Working Lunch (ACC Conference Room, BP-4306)	
12:30P	Depart	

MCG
TELMEDICINE CENTER

MCG Telemedicine Center

Other Resources for Current Information about Telemedicine

American Telemedicine Association
1700 One American Center
600 Congress Avenue
Austin, TX 78701
512/480-2247
512/480-2248 (fax)

Telemedicine Today (a quarterly newsletter)
Ace Allen, MD, Editor
P.O. Box 11122
Shawnee Mission, KS 66207-1122
913/588-4708
$75.00/year

Telemedicine: the monthly newsletter of telecommunications in healthcare
Telemedicine
Miller-Freeman, Inc
600 Harrison St.
San Francisco, CA 94107
415/905-2371
$397/year

Hours
Monday - Friday
8:00 a.m. - 5:00 p.m.

Telemedicine Library and Information Service

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706/721-6006 (fax)

November 1994

Telemedicine Library and Information Service

of the
Greenblatt Library
and
Telemedicine Center

Medical College of Georgia

TeLIS

Telemedicine Library and Information Service

Scope

The Telemedicine Library and Information Service (TeLIS) is being developed as a resource for telemedicine-related information and contains over 1000 items. Each item is indexed into a database using Medical Subject Headings and other subject headings specific to telemedicine.

The original scope of the database was articles primarily found in MEDLINE and various materials identified incidentally. The current scope includes articles from MEDLINE, HEALTH, telemedicine newsletters and proceedings from telemedicine conferences.

The database is being expanded to include engineering, technology and business materials from a variety of sources including additional databases, newsletters, newspapers, conference proceedings, technical reports, pamphlets, brochures, personal contacts and so forth.

Access

Access to the database is by request for a librarian-mediated subject search or on disk as a text (ASCII) file. Remote access (dial-in or internet) is planned but not yet available.

Access to the collection is available by appointment. Much of the material in the collection is also available at libraries around the country. We recommend use of your local libraries to acquire copies of material identified from the database.

If you are unable to find materials through your local sources, we will provide copies within the guidelines of the copyright law.

Fees

Fees for MCG-affiliated persons are the same as for other library services.

Fees for those not affiliated with the Medical College of Georgia are as follows:

- **Subject Search** **$40**
- **Disk with text (ASCII) file of citations and subject key** **$50**
- **Copies of materials** **$12/item**

History

The early roots of the Telemedicine Library and Information Service were the Telemedicine collection and database, which were developed at the Dean Foundation at the University of Wisconsin with the financial assistance of the American Psychiatric Association.

The collection and database of telemedicine-related materials were transferred to the Medical College of Georgia Greenblatt Library in fall 1992 as an adjunct of the MCG Telemedicine Center. It is housed in the Greenblatt Library as one of the Library's Special Collections.

The Greenblatt Library receives requests for telemedicine information from educators, clinicians, students, industry, military and the government.

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John Searle, PhD, Technical Director - jsearle@bmesun2.mcg.edu

- The Medical College of Georgia established the first statewide telemedicine program in November 1991.
- **Georgia Statewide Telemedicine Program (GSTP):** In 1992, the Medical College of Georgia was asked by the state to develop, coordinate, implement and manage the Georgia Statewide Telemedicine Program (GSTP) as a component of the Georgia Statewide Academic and Medical System (GSAMS). Today, through the use of fully interactive, two-way T1 lines to transmit audio and video, the GSTP links hospitals, outpatient clinics, community and public health centers and state prisons. Four of the state prisons will be served by a mobile telemedicine van. Forty-four of the 61 planned sites are fully operational, with network completion expected by 1997. To date, over 1000 consultations have been conducted. To date, the five most requested medical specialties are: Neurology, Cardiology, Dermatology, Psychiatry, and Infectious Diseases, while the top three ancillary specialties are: Occupational Therapy, Physical Therapy, and Speech Pathology.
- **Electronic House Call (EHC) Project:** The Medical College of Georgia, the Georgia Institute of Technology, and the Eisenhower Army Medical Center collaborated to develop and evaluate a "proof-of-concept" system to deliver medical care to patients in their homes by installing computer-based monitoring units in the homes of 25 volunteer patients and in one skilled nursing home in the Augusta, Georgia area. The units are linked to central monitoring stations via bi-directional coaxial cable connection supplied by Jones InterCable, Inc.. Interactive audio/video conferencing between patient units and the central monitoring station is supplemented by equipment to assess several patient physiologic parameters including blood pressure, pulse, temperature, weight, blood oxygen, electrocardiogram and stethoscope examination. The central idea is that these communication links will enable the monitoring of a broad range of patient measurements from home. This will in turn promote the patient's medical stability and reduce the need to access high cost in-patient and emergency resources. The project's focus is to expand medical care in the patient's home without the need for an onsite care provider. Major funding for this research came from The Georgia Research Alliance, the Army Medical Research and Development Command, and the Medical College of Georgia, with in-kind contributions from Jones InterCable, Inc..
- **Children's Medical Services (CMS) Project:** The Medical College of Georgia Department of Pediatrics and Telemedicine Center have contracted with the Children's Medical Services Program, of the Georgia Department of Human Resources to provide a pilot clinical service that addresses emerging issues of children with special health care needs to specified sites in Georgia using the Georgia Statewide Telemedicine Program (GSTP). This is the first such Telemedicine clinical program in the State. The State CMS Program employs specially trained registered nurses to work with local primary physicians and health care providers. In this Project, the CMS nurses will be specially trained in the technology and operations of the GSTP, will assume the role of the

attending health care professional at the remote CMS Telemedicine site and will present patients to specialist consultants at the MCG Telemedicine site. This will allow the children to remain in the care of their local primary care physicians and in their local community, thus enhancing continuity of care. The Project is evaluating the impact, efficacy, efficiency, and cost-benefit of providing clinical care via Telemedicine to children with special health care needs.

- **Telepsychiatry Project:** The Telepsychiatry project uses the Georgia Statewide Telemedicine Program (GSTP) to give Georgia residents access to quality mental health care regardless of their location in the state. The GSTP connects the Medical College of Georgia Department of Psychiatry, eight statewide psychiatric institutions, and several community mental health centers. Diagnostic assessments, mental status evaluations, and pharmacological consultations are some of the available services provided by the Telepsychiatry program. The project allows more rapid intervention during psychiatric emergencies, reduces the need to travel great distances to receive psychiatric care and provides second opinion options. It also enables mental health professionals and rural physicians to keep abreast of current research and information related to psychological services more easily, and should definitively reduce the unit cost of mental health care in Georgia. The Telepsychiatry project is an initial step towards integrating telemedicine with an active state mental health care program. You may wish to visit the Georgia Mental HealthNet at www.mcg.edu/Resources/MH/Index.html. The Georgia Mental HealthNet is an Internet site supported by the Medical College of Georgia in order to provide information and services to consumers in Georgia, and to provide a forum for mental health professionals to discuss current developments in the mental health field.
- **Telemedicine Standardized Patient Program (TSPP):** The TSPP is designed as an educational tool for providers of the Georgia Statewide Telemedicine Program (GSTP). The standardized patient is an individual who portrays or "models" an actual patient in a standardized fashion. Several scenarios will be developed for the standardized patient to portray, including neurologic, dermatologic, cardiac, psychiatric, rheumatologic, infectious disease, and surgical "conditions." Because these are among the most requested telemedicine consultations since late 1991, they will provide a comprehensive level of practical experience with the telemedicine system. This targeted clinical training program addresses the conduct and experience of clinical consultations through standards-based training, providing specialized clinical and communications training through presentation and examination of "mock" patients via telemedicine. This will include (1) educating the provider and the site coordinator about the "art" of medicine in a telemedicine environment, (2) addressing and ultimately eliminating any anxieties on the part of the providers and coordinators prior to their first "real" telemedicine consultation, (3) providing an opportunity to experience differences in operation, selection and flexibility of telemedicine equipment with regard to specific clinical conditions, and ultimately (4) encouraging generalist-to-specialist discussion about how telemedicine can better serve the health needs of patients.
- **Healthcare Finance Administration (HCFA) Grant:** The HCFA Study is aimed at evaluating the effects of telemedicine systems on the accessibility, quality and cost of health care. Coordinated and conducted by the School of Public Health of the University of Michigan and the Medical College of Georgia, the project consists of developing and implementing a detailed methodology for evaluating telemedicine. Included in the evaluation design are (1) a quasi-experimental study of clients and providers in selected experimental and control communities and (2) a study to compare the content, process and outcome of episodes of care with and without telemedicine. Results from the study

should clarify the role of telemedicine in addressing serious problems in health care delivery, namely, unequal and inequitable distribution of health resources, uneven quality of care, and lack of access to care for disadvantaged segments in the population. Telemedicine has yet to be adequately evaluated in terms of these issues in a comprehensive and systematic fashion. Without such evaluation, the true merit of telemedicine cannot be determined. The proposed project derives from an identification of the core elements of telemedicine, and it addresses these central issues of concern to policymakers, practitioners, and students of health care organizations.

- **Web Site:** For more information visit the Medical College of Georgia, Telemedicine Center Web Page at http://www.mcg.edu/Telemedicine/.

The Medical College of Georgia Telemedicine Center

Eliminating Distance; Enhancing Health Care

The Medical College of Georgia Telemedicine Center is establishing a statewide network linking 59 healthcare and correctional facilities that maximizes the care each facility offers as it reduces costs and improves convenience for patients.

That same network is being used by the federal Health Care Financing Administration to develop standards for this evolving mode of healthcare delivery and as a role model for other states and countries working on similar systems.

Also, telemedicine has laid the groundwork for sweeping changes in education that put doctors and other healthcare providers in the classroom to teach children about staying healthy and make it possible for Georgia's healthcare providers to tap into a system that keeps them abreast of changes in their dynamic fields without leaving their respective towns.

These rapid strides toward addressing the complex issues of improving healthcare in rural America and reducing healthcare costs fit hand-in-glove with MCG's role as Georgia's health sciences university, said Dr. Francis J. Tedesco, MCG President and the man who brought the concept to the Augusta campus.

His original plans have nearly been met for the system that uses computers and high-resolution cameras linked by a special grouping of telephone lines and fiber-optic cables to make long-distance patient examination possible.

With telemedicine, a doctor at a hub site, such as MCG Hospital, can work with a doctor in another city, helping examine a patient, looking inside his eyes and ears, listening to his heart, peering into his gastrointestinal tract for problems, seeing essentially what the patient's own doctor sees while he's standing in the same room.

"I wanted to network the entire state to elevate the ability for patients to get a higher level of consultative care through their primary-care giver without having to travel great distances," Dr. Tedesco said.

The program began in November 1991 with a 130-mile relationship between MCG Hospital and Clinics and Dodge County Hospital in Eastman, Ga.

Today it's a developing network called the Georgia Statewide Telemedicine Program linking hospitals as well as outpatient clinics, community and public health centers and correctional facilities.

Experience with the Dodge County remote has shown that approximately 85 percent of the time, telemedicine means a patient can receive definitive care in his own city, and doesn't have to travel by car or ambulance to some other city and hospital.

"It fits in perfectly with MCG's commitment to enhancing primary-care givers and with, long term, what the federal government wants to do," Dr. Tedesco said. "The government is saying we need to create more generalists, less specialists. With telemedicine, this allows you to have more generalists and for them to feel more comfortable because they can be hooked up with specialists, but remotely," he said.

"Healthcare suffers when it's isolated, when it's out of the mainstream of new knowledge, when it doesn't have access to special expertise in those cases where you need it," said Dr. Darrell G. Kirch, Dean of the MCG School of Medicine. "This is just using the technology to fill those gaps. This is the information and electronic age yielding benefit for healthcare," he said.

"What we have found with Dodge County is very clear, Dr. Tedesco said. "The primary-care doctors in this rural community are actually expanding their practice because they are willing to take on more complex cases knowing that they have specialists who will be electronically giving them support," he said. "That was the concept in developing this; that is working out."

Other concepts being developed include:

•Establishment of a learning center where physicians, coordinators and other users can get hands-on experience using telemedicine technology so they feel comfortable with it before ever sitting down for their first consult via telemedicine.

•Telemedicine house calls will be made possible by the same lines that bring cable television into the home. This will allow patients with chronic health problems such as congestive heart failure or severe asthma to see healthcare providers daily with the idea of warding off complications and avoiding costly hospitalization.

•A system for nursing homes will allow daily monitoring of this at-risk population, again to nip a mounting healthcare problem in its bud.

•A networking of hospitals will provide extensive services for children. As a test site, the MCG Children's Medical Center is establishing a link with the neonatal intensive care nursery at Phoebe Putney Memorial Hospital in Albany that enables pediatric cardiologists in Augusta to assess babies with potential heart problems in Albany.

•A networking of Georgia's public mental health hospitals and community centers to improve accessibility to psychiatric healthcare for Georgians as well as provide continuing education for mental-health professionals. This telepsychiatry project, funded by a $1.5 million National Patterns of Academic Excellence grant from the University System of Georgia Board of Regents, takes aim at Georgia's maldistribution of mental-health services.

•A networking of Georgia's prisons with the prison hospital, Augusta Correctional and Medical Institute, and with other hospitals as needed, to provide definitive care to prisoners without the safety risk and cost of transporting them.

"We are not only the most comprehensive statewide telemedicine system in the country from the standpoint of the number of sites, we are the most comprehensive from the various types of patient populations that we are dealing with," said Dr. Jay H. Sanders, the center's Director.

A common thread for these initiatives is to offer healthcare services, and now healthcare education as well, in the most timely and cost-efficient manner.

A Health Care Financing Administration grant is testing the strength of that thread by providing the country with the first objective measure of telemedicine's impact on the accessibility, quality and cost of healthcare. Under terms of the $1.3 million dollar grant, the MCG Telemedicine Center is working with evaluators at the University of Michigan to examine the various aspects of this burgeoning approach to providing healthcare. Information gathered will be used by the Health Care Financing Administration in its evaluation of other states' telemedicine programs and in determining reimbursement for healthcare services provided by those systems, Dr. Sanders said.

"In a few years, everybody will be doing telemedicine," Dr. Kirch said. "As an academic medical center, our mission, now is evolving so that, just as we have been the leader in setting up a prototype network, we will now be leaders in research on the uses of the technology. In which cases is it most effective in delivering care? Where does it save costs? Where might it end up increasing costs? How do patients respond? How do providers respond when asked to use it?," the Dean said.

All the activity in patient care provided long-distance has spurred interest in long-distance learning as well.

Southern Bell and 33 independent telephone companies, including Sprint and AT&T, in consultation with MCG and the state Department of Administrative Services, have networked an extensive system of telephone lines called the Georgia Statewide Academic and Medical System, which will allow all telemedicine sites to communicate with each other and with distance-learning sites in Georgia's high schools, colleges, universities and select hospitals.

"(MCG faculty) can do site presentations. They can use overheads. They can present patients and do grand rounds over telemedicine," said Laura Adams, Director of Operations for the MCG Telemedicine Center. "You are not limited to another telemedicine site that can only hold 10 people. You can go to distance- learning sites in an area where all the hospitals and health clinics have been able to bring all of their physicians and other healthcare providers into an auditorium to receive this information."

In fact, MCG's third telemedicine hub site is being designed with teaching in mind; it will be a larger room in the hospital with ample space for more than one doctor and a patient. MCG also has a telemedicine site in the emergency room with the idea of easy access for 24-hour coverage and an additional consult site in the Ambulatory Care Center

"The potential of this is enormous," Dr. Tedesco said. "What we are talking about is education without walls. It's possible that we can extend our educational capabilities to the citizens of Georgia without having to build buildings in every location, without having to hire teachers in every location. I think we have the ability to maximize health-sciences education around the state in a way that young people in certain areas can get their education while residing in their communities and using the clinical training in their communities," he said.

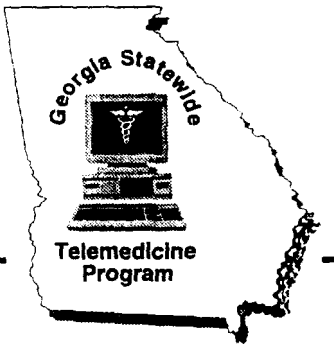
Funding to support the major telemedicine expansion and for distance- learning initiatives comes from Georgia Senate Bill 144, The Distance Learning and Telemedicine Act of 1992, which has made a total of $73 million available in three phases, approximately $60 million for distance learning and related telecommunication projects and $13 million for telemedicine.

Dollars earmarked for telemedicine helped provide equipment upgrades for some of Georgia's existing telemedicine locations and dollars for the original equipment and installation for newer sites, Mrs. Adams said. Money also will pay half the monthly fees for transmission for the first two years of operation and equipment maintenance for the second year for most telemedicine sites.

Additionally dollars from the Georgia Department of Human Resources have funded several telemedicine initiatives in rural areas including establishing sites at a community health center in Wrightsville and in the neonatal nursery in Albany. Dollars also were provided to upgrade three existing telemedicine sites in rural Georgia, to partially fund a statewide newsletter for telemedicine sites and for educational forums such as the statewide telemedicine meeting in Augusta in July 1995.

"Quite candidly this would not have happened without the commitment and funding from the state," Dr. Sanders said. The technology has existed for years. "What made it happen was the fact that the state believed in it, the state said, 'Let's try it,' and then backed that with the appropriate funding and the commitment on the part of people," he said. The state Department of Administrative Services and Southern Bell have been key players.

"Medical care in this country is episodic, it's irregular," Dr. Sanders said. "It occurs at the wrong time. It waits until the patient gets sick rather than preventing the illness. When you realize that so many of the illnesses that we deal with in the elderly are illnesses that began when these people were very young, you begin to get a feel for how significant an impact we could make if we started at the right time. Telemedicine helps facilitate that. I think it will provide an incredible cost benefit to our society."



Introduction

- Private Switched T-1 Network (GSAMS) Partitioned for Distance Learning (350+ sites) and Telemedicine (45+ sites) - Administered by State Government (see GSAMS map)
- Telemedicine Connects Point-to-Point at T-1 Bandwidth
- Distance Learning Connects Multipoint at 1/2 T-1 Bandwidth
- GSTP Has Hub and Remote Structure But Any Site May Connect to Any Other Site
- All Remote Sites (primary care) Configured Identically
- All Hub Sites (specialty or primary care) Configured Identically
- TM Sites May "Downgrade" to DL Capability: 1/2 T-1, No Control, Stethoscope, Still Image

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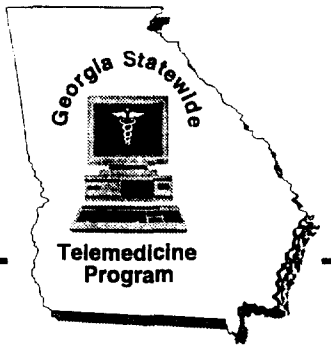

Diagnostic Quality Video

Three-Chip (CCD) Patient Exam Camera

- Tripod and Dolly for Optimum Visualization
- 16:1 Zoom Lens
- Local and Remote Control of Pan, Tilt, Zoom, Focus, Aperture
- Three Speed Control for Precise Adjustment

Single Chip (CCD) Room Camera

- Fixed Between Display Monitors
- 10:1 Zoom Lens
- Local and Remote Control of Pan, Tilt, Zoom, Focus, Aperture
- Three Speed Control for Precise Adjustment

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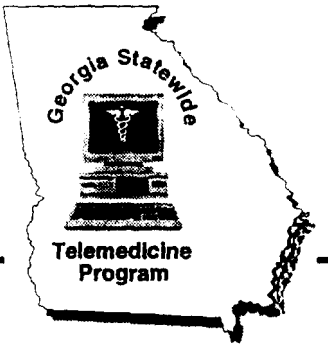

Diagnostic Quality Video...

Micro Camera

- Miniature Remote Head, Single Chip (CCD)
- Adaptors and Scopes at All Sites: Otoscope (Ear), Ophthalmoscope (Eye), Microscope
- C-Mount to Any Scope (i.e. Laparoscope)

Document Camera (Elmo)

- View Paper or 3-D Objects (i.e. Medications)
- Manual Focus, Aperture, Position
- Back Light for Slides, Sheet X-Ray Film

External

- Portable Diagnostic Devices (e. g. Ultrasound)
- S-VHS VTR as Source or Event Recorder

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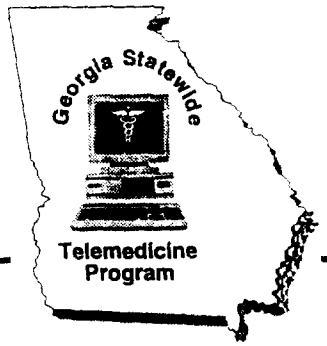

Still Images

- Capture Directly From Source - High Quality Component (Y/C) Video Instead of Composite
- High Resolution Display, Interactive Annotation, Lossless Image File Transfer

Audio

- Fully Interactive Room Audio
- Table and Wireless Microphones
- Electronic Stethoscope, CD Quality

Information

- Central Administrative Database and Distributed Multimedia Patient Database
- Group 3 Fax (Printer)
- Medical Reference on CD ROM at Each Site

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GEORGIA STATEWIDE
TELMEDICINE PROGRAM

GSTP

Georgia Statewide
Telemedicine Program

IMPROVED ACCESS TO SPECIALTY MEDICAL CONSULTATION THROUGH TELEMEDICINE

The Georgia Statewide Academic and Medical System

GSTP Fact Sheet

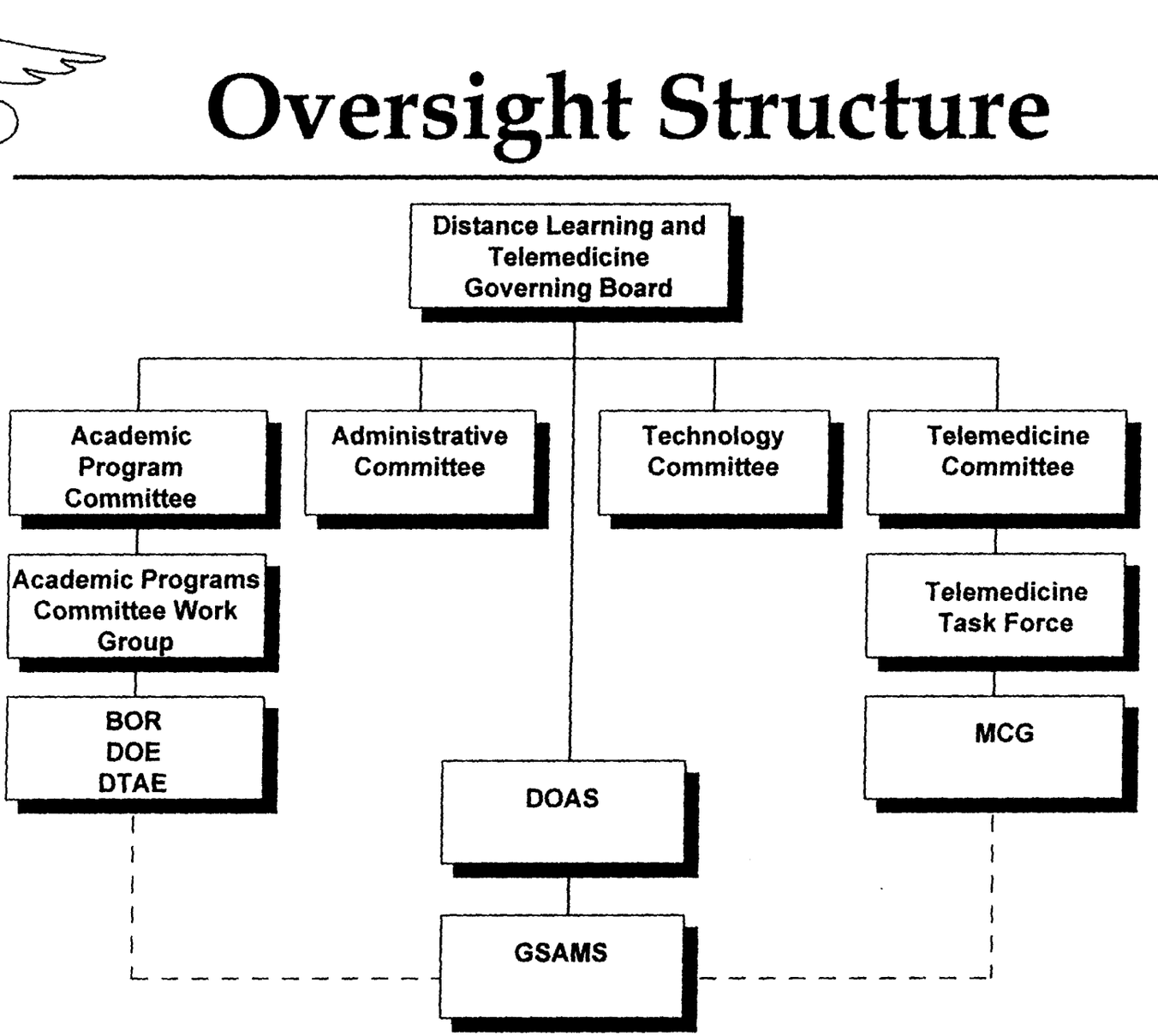
The Bottom Line

Consultations 11/1991 - 12/1996	**2075**
Average Consultation Length	**26 minutes**
Patients retained in local communities	**91.46%**

Summary

- The Georgia Statewide Telemedicine Program improves access to medical specialty care throughout the state.
-
- Patients are retained in local communities.
- Utilization has increased almost 50% in the past year.
- 44 of 61 sites are operational as of 12/1996.
- The top five requested medical consultations are:
  1. Neurology
  2. Psychiatry
  3. Cardiology
  4. Dermatology
  5. Infectious Diseases
- The top three requested ancillary consultations are:
  1. Speech Therapy
  2. Physical Therapy
  3. Occupational Therapy

Oversight Structure



Georgia Statewide Telemedicine Program (GSTP)

The Medical College of Georgia Telemedicine Center, in concert with GSTP sites, has developed a comprehensive statewide telemedicine program that utilizes standardized procedures, protocols, and data collection. Additionally, program development includes a detailed analysis of each room site, resulting in an optimal clinical and operational telemedicine room tailored to the site's needs. The telemedicine equipment design has been standardized and detailed installation instructions provided to the integrators to ensure each system is installed to the "gold standard." Additionally, a formal procedure for comprehensive technical validation of each component of the system is conducted prior to declaring a site operational. The program was designed to include remote diagnostic capabilities, and a 24 hour, seven-day-a-week trouble hot line, and a network responsive to 24 hour, seven-day-a-week connections at a moment's notice.

The Georgia Statewide Telemedicine Program (GSTP) strives to continually increase statewide access to specialty and subspecialty care and ultimately to enhance the overall delivery of health care to all citizens throughout the state of Georgia. The Medical College of Georgia Telemedicine Center continues to improve implementation, expansion, integration, promotion, and management of the GSTP for access and use by all appropriate individuals, organizations, and institutions in Georgia.

- **Management:** Having established the first statewide telemedicine program in November of 1991, the Medical College of Georgia was asked by the state to develop, coordinate, implement and manage the Georgia Statewide Telemedicine Program (GSTP). This telemedicine program is a component of State Senate Bill 144, "The Georgia Distance Learning and Telemedicine Act of 1992," which set forth provisions to establish a network called the Georgia Statewide Academic and Medical System (GSAMS) and its telemedicine and distance learning programs. GSAMS is the world's largest and most comprehensive distance learning and telemedicine network, currently connecting over 400 sites.

- **Technology:** The telemedicine component uses T1 lines (1.544 Mb/s) to transmit fully interactive two-way audio, video, and diagnostic data. The telemedicine system integrates various medical peripherals such as an otoscope, ophthalmoscope, microscope, and electronic stethoscope. High resolution cameras enable consultants to see whatever the presenting provider at the remote location sees. Using custom and commercially available adapters, they can look into the ears with an otoscope, examine the bladder with a cytoscope, examine the stomach with an endoscope, and examine the throat with a laryngoscope. They can also zoom in and study in detail a rash or wound, the eye, or the inside of the mouth. The GSAMS network also allows the telemedicine sites to downgrade their systems for interconnection with the GSAMS distance learning sites at a ½T rate to transmit audio and video only, thereby providing health education to the community and continuing education to health care providers.

- **Funding:** The entire funding for the development of the GSTP has been generated by the state. The Distance Learning and Telemedicine Act of 1992 has provided approximately $10 million for the installation of T1 and business lines, purchase of telemedicine equipment and cabinetry for 51 sites (including two lab sites), 50% subsidy of line and maintenance costs per site for two years, funding for technical training and clinical-specific training, development of a multi-media patient record system, and other program supporting efforts. The Medical College of Georgia procured contracts with the State Office of Rural Health totaling $1.4 million. These funds were used to fund seven of the 61 telemedicine sites, develop a Patient Administrative Database, provide for database and refresher training, pay monthly line costs for remote telemedicine sites, support of a quarterly GSTP newsletter and annual conference, and purchase Scientific American CD for remote telemedicine sites. Additionally, the Medical College of Georgia provided $1.2 million of internal funds toward the development of the GSTP. These funds were used to fund five of the 61 telemedicine sites, line cost for eleven sites, purchase of telemedicine lab testing and validation equipment, development of Operations Manuals, development and distribution of a videotape describing the GSTP and showcasing clinical use, and providing manuals and other supporting telemedicine program documentation to all sites.

- **Implementation:** Today, the Georgia Statewide Telemedicine Program (GSTP) is a rapidly developing network, linking hospitals, health departments, community and public health centers, and state prisons in towns and cities across the state where patients, providers, and health care facilities can benefit most from this unique relationship. With the Medical College of Georgia serving as its oversight agency, the GSTP will ultimately link 61 telemedicine sites throughout the state. The 61-site network includes a series of remote sites, secondary hub sites, and tertiary hub sites including seven Georgia Department of Corrections sites (four of which will be served by a mobile telemedicine van) and three of Georgia's major referral centers - Medical College of Georgia, Eisenhower Army Medical Center, and Emory University Hospital serving as tertiary hub sites. Currently, 46 sites are fully installed and operational. It is anticipated that by 1997, all 61 sites will be identified, installed and operational.

- **Utilization:** The GSTP is designed for use by all types of health care providers and supports initial and follow up consultations, established specialty clinics, and emergency consultations. Just as standard referral patterns are typically regional, telemedicine remote sites typically seek consultative care at the nearest telemedicine hub site. However, any GSTP site can connect to any other GSTP site to obtain services not ordinarily available. GSTP utilization has doubled in the last year. More than 1000 consultations have been conducted to date, utilizing more than 40 medical specialties and subspecialties, as well as ancillary specialties. The percentage of patients able to remain in their local communities to receive health care averages

- **Children's Medical Services (CMS) Project:** The Medical College of Georgia Department of Pediatrics and Telemedicine Center have contracted with the Children's Medical Services Program, of the Georgia Department of Human Resources to provide a pilot clinical service that addresses emerging issues of children with special health care needs to specified sites in Georgia using the Georgia Statewide Telemedicine Program (GSTP). This is the first such Telemedicine clinical program in the State. The State CMS Program employs specially trained registered nurses to work with local primary physicians and health care providers. In this Project, the CMS nurses will be specially trained in the technology and operations of the GSTP, will assume the role of the attending health care professional at the remote CMS Telemedicine site and will present patients to specialist consultants at the MCG Telemedicine site. This will allow the children to remain in the care of their local primary care physicians and in their local community, thus enhancing continuity of care. The Project is evaluating the impact, efficacy, efficiency, and cost-benefit of providing clinical care via telemedicine to children with special health care needs.

- **Telepsychiatry Project:** The Telepsychiatry project uses the Georgia Statewide Telemedicine Program (GSTP) to give Georgia residents access to quality mental health care regardless of their location in the state. The GSTP connects the Medical College of Georgia Department of Psychiatry, eight statewide psychiatric institutions, and several community mental health centers. Diagnostic assessments, mental status evaluations, and pharmacological consultations are some of the available services provided by the Telepsychiatry program. The project allows more rapid intervention during psychiatric emergencies, reduces the need to travel great distances to receive psychiatric care and provides second opinion options. It also enables mental health professionals and rural physicians to keep abreast of current research and information related to psychological services more easily, and should definitively reduce the unit cost of mental health care in Georgia. The Telepsychiatry project is an initial step towards integrating telemedicine with an active state mental health care program. You may wish to visit the Georgia Mental HealthNet at www.mcg.edu/Resources/MH/Index.html. The Georgia Mental HealthNet is an Internet site supported by the Medical College of Georgia in order to provide information and services to consumers in Georgia, and to provide a forum for mental health professionals to discuss current developments in the mental health field.

- **Healthcare Finance Administration (HCFA) Study:** The HCFA Study is aimed at evaluating the effects of telemedicine systems on the accessibility, quality and cost of health care. Coordinated and conducted by the School of Public Health of the University of Michigan and the Medical College of Georgia, the project consists of developing and implementing a detailed methodology for evaluating telemedicine. Included in the evaluation design are (1) a quasi-experimental study of clients and providers in selected experimental and control communities and (2) a study to compare the content, process and outcome of episodes of care with and without telemedicine. Results from the study should clarify the role of telemedicine in addressing serious

problems in health care delivery, namely, unequal and inequitable distribution of health resources, uneven quality of care, and lack of access to care for disadvantaged segments in the population. Telemedicine has yet to be adequately evaluated in terms of these issues in a comprehensive and systematic fashion. Without such evaluation, the true merit of telemedicine cannot be determined. The proposed project derives from an identification of the core elements of telemedicine, and it addresses these central issues of concern to policy makers, practitioners, and students of health care organizations.

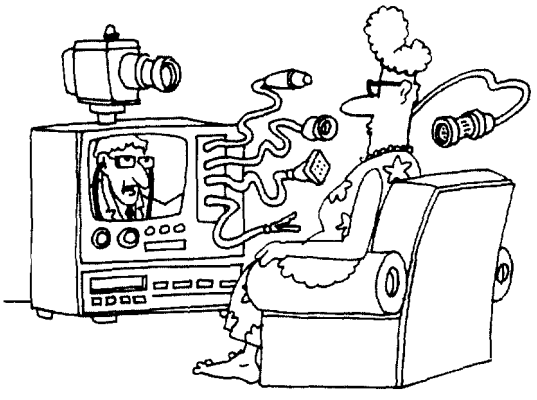
- **Electronic House Call (EHC) Project:** The Medical College of Georgia, the Georgia Institute of Technology, and the Eisenhower Army Medical Center collaborated to develop and evaluate a "proof-of-concept" system to deliver medical care to patients in their homes by installing computer-based monitoring units in the homes of 25 volunteer patients and in one skilled nursing home in the Augusta, Georgia area. The units are linked to central monitoring stations via bi-directional coaxial cable connection supplied by Jones InterCable, Inc.. Interactive audio/video conferencing between patient units and the central monitoring station is supplemented by equipment to assess several patient physiologic parameters including blood pressure, pulse, temperature, weight, blood oxygen, electrocardiogram and stethoscope examination. The central idea is that these communication links will enable the monitoring of a broad range of patient measurements from home. This will in turn promote the patient's medical stability and reduce the need to access high cost in-patient and emergency resources. The project's focus is to expand medical care in the patient's home without the need for an on-site care provider. Major funding for this research came from The Georgia Research Alliance, the Army Medical Research and Development Command, and the Medical College of Georgia, with in-kind contributions from Jones InterCable, Inc..

Georgia Statewide Telemedicine Program

The Telemedicine Connection

Information about the delivery of healthcare and education through telemedicine

Funding Approved for Development of "Electronic Housecall"



Taking Telemedicine Into the Home

Toni Baker
MCG News Bureau Coordinator

An "electronic house call" that takes your doctor from his office to your living room is being developed and tested to see if it's an effective, cost-efficient way to deliver healthcare.

"In the same way I can now pick up the phone and talk to my patient at his home, I will soon be able to pick up my multimedia platform and not only talk to my patient, but see and examine my patient," said Dr. Jay Sanders, Eminent Scholar of Telemedicine at the Medical College of Georgia Telemedicine Center.

Development of a long-distance patient examination system that connects a patient's home to his doctor's office is the major initiative for approximately $2 million in grants awarded to MCG, including a $916,687 grant from the U. S. Department of the Army and a $950,000 grant from the Georgia Research Alliance.

MCG is collaborating with the Georgia Institute of Technology and Dwight David Eisenhower Army Medical Center to develop the technology and with Eisenhower to evaluate this system in the homes of some 25 adults and children in the Augusta area with chronic medical problems.

"Our first approach is going to be to the people who need it the most, the chronic-disease patients," Dr. Sanders said, referring to patients with problems such as severe diabetes, congestive heart failure or liver and lung disease. "If you went to any hospital in the country and asked the administrator, 'Who are the patients who use up the majority of your resources?,' they would give you the same list of patients with the same type (of) diagnoses. But we

...continued on page 2

New Telemedicine Position Focuses on Patient Care

Dr. Max E. Stachura, endocrinologist and Professor of Medicine at the Medical College of Georgia, has been appointed Clinical Director of the MCG Telemedicine Center.

Dr. Jay Sanders, Director of the Telemedicine Center since October 1992, assumes the duties of President of the American Telemedicine Association in early 1996 and will leave MCG in June 1996. To ease the transition, Dr. Stachura also assumed the duties of Interim Director on Sept. 17.

"Dr. Sanders is assuming significant new duties as President of the American Telemedicine Association and has decided to devote his time to this and other new pursuits," Dr. Darrell G. Kirch, Dean, MCG School of Medicine, said in announcing Dr. Stachura's appointment. "While his departure will be a loss for this institution, the internationally recognized telemedicine program here will continue to thrive because of the foundation he has helped build."

In the new position of Clinical Director, Dr. Stachura will be responsible for patient-care program development for the MCG Telemedicine Center as well as for the Georgia Statewide Telemedicine Program, a network of 59 telemedicine sites being established in hospitals, clinics and correctional facilities across the state.

"This is a key role in helping us move telemedicine from a concept to a tool that is an everyday part of our armamentarium in caring for patients around our state and beyond," Dr. Kirch said.

Dr. Max E. Stachura

Dr. Stachura is a 1965 graduate of Harvard Medical School who completed post-graduate training in internal medicine as well as a National Institutes of Health endocrinology fellowship at State University of New York at Buffalo.

He came to Augusta in 1981 as Chief of the Section of Endocrinology at MCG and the Department of Veterans Affairs Medical Center. ■

Inside This Issue